

OIL AND CHEMICAL
SPILL CONTINGENCY PLANNING
REQUIREMENTS
FOR A MACKENZIE VALLEY
PIPELINE

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Environment Canada

MACKENZIE VALLEY PIPELINE PROJECT
EXHIBIT NO. 470 A E Feb 14/76
Invoice not
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A. INTRODUCTION:

During the construction and operation of gas and oil pipelines through the northern Yukon and Mackenzie Valley, there will be large volumes of petrochemicals transported, stored and disposed of along the route. Arctic Gas has estimated in their application that about 400,000 tons of fuel and methanol would be used in the construction of their gas line.

Fuel will be transported to the site by road, the Mackenzie River barge system, air transport and ocean shipping. Their application goes on to state:

"Where fuel must be stored, a separate area will be set aside for storage tanks, and dikes will be placed around the tanks. These areas will be constructed in such a manner as to provide an impermeable barrier.

When small volumes of fuel must be stored, liquid fuel storage tanks of the "bladder tank" type (up to 1500 bbl capacity) will be used. For larger fuel storage requirements, steel tanks (up to 5000 bbl capacity) may be used instead of, or in combination with bladder tanks".

The U.S. Environmental Protection Agency has estimated that there have been about 13,000 spills of oil substances in the United States annually since 1970. Spills have occurred during the building of the Alyeska pipeline itself. It seems inevitable, therefore, that despite the best intentions and preventive measures taken by a proponent,

spills will occur along a Mackenzie line. Concern for how such spills could affect the living environment and social well-being of local residents is, therefore, an important issue.

The present gas line applicants and future oil line proponents make frequent reference to oil and chemical spill contingency plans which will be written to handle any spills during the construction and operation of their lines. The gasline applicants outline in some detail the spill preventive measures planned for the facilities during their construction and operation. The applicants clearly recognize the seriousness and scale of the problem for which they are commended.

The following paper, prepared for the Environmental Emergency Branch of Environment Canada, contains recommendations on information which should be incorporated into a comprehensive Contingency Plan and site-specific Action Plans for spills of oil and other hazardous materials attributable to pipeline projects along the Mackenzie Valley routes.



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B. DEFINITION AND OBJECTIVES OF A CONTINGENCY PLAN

A contingency plan is a complete organizational package which provides a pattern of coordinated and integrated response to a spill of oil or other hazardous materials in order to protect the environment from the damaging effects.

The objectives of such a plan are:

- 1) To assure that health and the environment are provided with adequate protection by developing appropriate preparedness measures to minimize the damage caused by those spills which preventive measures have not been able to avoid.
- 2) To outline effective systems for detecting and reporting the existence of a pollution spill.
- 3) To provide for the prompt execution of measures to restrict the further spread of the pollutant.
- 4) To outline the techniques for cleanup and disposal of collected pollutants.
- 5) To provide direction on actions to pay cleanup costs and damage claims, and to prevent recurrences of similar incidents.

C. THE POTENTIAL FOR SPILL EMERGENCIES:

Spills of petroleum or other hazardous products could occur from a large number of sources and operations in a pipeline project. These include ocean and river shipping, marine vessel to shore transfer operations, on-shore storage facilities and tank truck transportation. Concentrated methanol solutions could be spilled if there was a pipeline rupture during pipe testing. In addition, other materials such as high temperature lubricants, X-ray photographic chemicals, spent engine oils and fluids, sewage and drinking water treatment chemicals and rust inhibitors, could also be released into the environment.

If containment and cleanup of spilled materials was not prompt, toxic effects could result in the damaging of aquatic life, waterfowl and fur-bearing animals downstream of the occurrence. Downstream intakes for industrial or drinking water supplies could also be affected. In winter, spills could migrate undetected under snow and ice cover, to areas a long distance removed from their source. Ice and low temperature conditions would make cleanup operations of spilled material difficult, slow and extremely costly.

Small spills would likely only affect the local land area or water body near the source of the material. Because the proposed gas and oil pipelines parallel the Mackenzie Valley for much of their route north of 60°, any major spills could enter this water system through tributaries and pollute large areas downstream. This would seem a particular threat during the operation phase of an oil line.

D. A SUMMARY OF SOME AREAS SENSITIVE TO PETROCHEMICAL SPILLS:

The most sensitive area for potential oil spill damage is the Mackenzie Delta. The aquatic habitats found in the delta lakes, streams and Mackenzie River main channels provide extensive areas for a diverse and large fish population. The Mackenzie River estuary provides overwintering areas for several species of anadromous fish and arctic cisco, least cisco, inconnu, and other species use the main channels for spawning. Broad and Humpback whitefish, inconnu, and two species of ciscoe use the channels for overwintering and migration routes to spawning areas. The smaller streams connecting the lakes and larger channels are often spawning areas for grayling, pike, humpback whitefish and least cisco. Lakes of sufficient depth and size provide habitat for several species. Ya Ya Lake and Parsons Lake are two important habitats for lake trout and grayling respectively.

The Delta is an extremely important area for domestic and commercial fisheries. The main channels and the delta coast are the locations of extensive fishing activities. Important fishing camps are centred around Aklavik in the western delta. Kugmallit Bay and the East channel are the areas of most eastern fishing activity. Whitefish Station and Kittigazuit are the main fishing camps in Shallow Bay. An important commercial fishery is centred around the East Channel - Holmes Creek area and most of the catch is sold in Inuvik.

A large oil spill in the delta or near the mouths of the Peel or Arctic Red River could cause serious damage to domestic and commercial fisheries in the area.

The Mackenzie estuary is also an important area for calving whales. Shallow Bay and Kugmallit Bay are nursery and calving areas for beluga whales during the summer months and provide good hunting for local residents. An oil spill could disturb the calving females and their young.

The Beaufort Sea coast estuaries and lagoons are important overwintering, feeding and possible spawning areas for char, grayling, cisco, whitefish, inconnu and other species. Domestic fishing is carried out at Shingle Point Komakuk Beach and Herschel.

Important fish resources and fisheries are also present on the Yukon north slope and interior routes. The Old Crow and Porcupine drainages have many spawning, overwintering and domestic fishery areas on them downstream of the present pipeline crossings.

Oil spills along the Beaufort Sea Coast and in the Mackenzie Delta could result in serious damage to large concentrations of waterfowl which use these areas during the summer months. Whistling swans, snow geese and other types of waterfowl and shorebirds account for almost three-quarters of the 52 species of birds using the Delta.

The Mackenzie Delta is one of the major waterfowl breeding areas in North America. The most important water-

fowl nesting or feeding areas are located in the western outer Delta, with the largest concentrations being found along the coast of Mackenzie Bay from Mallik Bay to Shingle Point. The East Channel is of moderate to high importance to waterfowl and the northeastern coast of Richards Island is of moderate importance to swans.

The Beaufort Sea coastal plain is another important area for resting and feeding activities. Waterfowl species concentrate around river delta areas, nesting near lakes of the coastal plain. The Mackenzie River Valley is used as a flyway by migrating birds during the spring and fall. During these migrations, stops may be made along the Mackenzie River for feeding or resting but these stops are short-term only. Oil spills on the Mackenzie during these migrations could prove harmful should the birds come in contact with the spill.

The Delta is also valuable habitat for muskrats, beaver, otter, mink and other fur-bearing species. Muskrats are by far the most economically important and support an extensive trapping industry. Muskrats are plentiful from the base of the Tuktoyaktuk Peninsula to the Thunder River. An oil spill in the Delta could have serious impacts upon the muskrat population and disrupt the local trapping industry.

The importance of the Mackenzie Delta to fish, waterfowl, and mammals cannot be over-emphasized. Oil spills in the Delta could seriously hurt the productivity of the fish and wildlife resources and directly affect the local residents who depend on these resources for their food and livelihood.

E. COMPONENTS OF A MACKENZIE VALLEY PIPELINE SPILL
CONTINGENCY PLAN:

Contractors and operators are expected by government to have an appropriate emergency organization to deal with any spills of oil or chemicals which might occur during the construction or operation of a pipeline through the Mackenzie Valley. Such an organization should have a workable written contingency plan which spells out how a spill emergency would be handled in the vicinity of the pipeline right-of-way and in areas downstream which could be affected.

The Contingency Plan for a Mackenzie Valley pipeline should be concise and uncluttered with extraneous detail. The Plan should include the following:

1. Purpose - This should explain the proponent's prevention and contingency goals and how it is intended that they be met.
2. Scope - The Plan should include spill emergency schemes on everything within the right-of-way and support facilities. It should also take into account accidents or environmental extremes which could originate outside or spread beyond the right-of-way boundaries such as oil or chemical spills from other operations in the area, flooding, landslides and vandalism.
3. Corporate policy and responsibilities - A brief point form outline of the senior management decisions on policy matters, legal requirements and moral responsibilities should be covered in this section. The

Plan should go into some detail on these points. Some policy questions which must be decided upon are the following:

- a) Is containment and cleanup of spills to be done in-house with Proponent staff, or using outside private contractors?
- b) What staff position levels have the predesignated authority to call out spill emergency containment and cleanup resources?
- c) What staff position levels have the authority to commit the Proponent financially to cleanup contractors, and to what amount?
- d) What are the relationships to be with other petroleum industry and development operators regarding spill prevention and mitigation in the area?
- e) What will be the distribution of the Contingency Plan and site-specific action plans in support of it both within and outside the Proponent organization?
- f) How are media and public relations enquiries to be handled during spills along the pipeline?

Legislative requirements for the Proponent to satisfy other than those which will be outlined in the permit documentation to construct the line include the following:

A. Federal Acts:

- a) Department of Indian Affairs and Northern Development administered Acts and Regulations
 - i) Northern Inland Waters Act
 - ii) Arctic Waters Pollution Prevention Act - Arctic Waters Pollution Prevention Regulations
 - iii) Territorial Lands Act
 - iv) The Oil and Gas Production and Conservation Act
- b) Department of the Environment administered Acts and Regulations:
 - i) The Fisheries Act
 - ii) Migratory Birds Convention Act
 - iii) Canada Water Act
 - iv) Clean Air Act
 - v) Environmental Contaminants Act
 - vi) Ocean Dumping Act
- c) Ministry of Transport administered Acts and Regulations:
 - i) Arctic Shipping Pollution Prevention Regulations
 - ii) Canada Shipping Act - Oil Pollution Prevention Regulations

B. Territorial Ordinances:

- i) Environmental Protection Ordinance (NWT)
- ii) Gas Handling Ordinance.
- iii) Public Health Ordinance

Pertinent parts of this legislation should be summarized in the plan and detailed in an appendix.

4. Planning and Response Elements - This part of the plan should explain how the Contingency Plan is organized, how it fits into other plans in the area and how the emergency response is co-ordinated.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) On-Scene-Commanders (OSC's) be pre-designated for spill accidents within the scope of the plan.
 - ii) Alternate OSC's be pre-designated to act in the absence of the regular OSC.
 - iii) Spill Response Team members (SRT's) and their alternates be pre-designated and each member be assigned to be responsible for the management of one of the following functions: Logistics (transportation, communications and accommodation), equipment (cleanup machinery and materials), manpower (Proponent employees, contracted workers, volunteers), public and press information, environmental matters, legal advice and office services. Any necessary technical, environmental or managerial advisors should be under the direction of the OSC, but could work closely with any one of the SRT members.
 - iv) Spill Response Centres (SRC's) be pre-designated as the operations co-ordinating centre to implement Action Plans for spill emergencies along the line.
5. Response Operations - Actions taken to respond to a spill incident can be divided into five overlapping phases. These are: Discovery and Notification, Containment and Countermeasures, Cleanup and Disposal, Restoration and Payment of damages, Cleanup Costs and Fines.

a) Spill Discovery and Notification:

These two steps are very important to the Action Plan. If spills or leaks are not quickly discovered and a good notification system for reporting them developed, the first few critical hours of a spill incident would be lost to the containment process. This could result in unnecessary environmental damage. Spill discovery could be the result of casual observation or by routine facility checks by the Proponent staff and contractors. Notification includes internal Proponent organization reporting and external government agency affected public and possible media alerting.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) Personnel manning Proponent telephone and radio-telephone numbers normally available for service to the public be informed of who to notify in the pipeline corporation if a leak or spill is spotted by a member of the public and reported to these numbers.
- ii) A spill emergency phone number be circulated to government agencies concerned with spills of hazardous substances from a Mackenzie line into the environment, (e.g. Ministry of Transport, Dept. of the Environment, Dept. of Indian and Northern Affairs) to enable them to contact the Proponent through suitable channels if they receive reports of, or observe spills from the pipeline.

- iii) A documented system of regularly scheduled inspections of pipeline facilities be followed by Proponent staff to check for actual and potential fuel leaks or spills at key areas along the pipeline and around associated facility property. Systems of automatic alarms for warning of tank farm leaks or oil transfer operation spills should be considered.
- iv) A spill notification and information system be instituted in the Proponent organization to inform appropriate Senior staff and concerned government agencies and potentially affected or involved Mackenzie Valley or Yukon North slope industries and municipalities of a spill and keep them informed on containment and cleanup activities. The severity of the spill will generally determine the notification pattern and extent.
- v) Notification be done through a specific pre-designated Proponent "dispatcher", so that the personnel directly concerned with a spill problem along the line can get on with the job of controlling the spill.

b) Spill Containment and Countermeasures:

This phase includes the deployment as directed by the OSC (with assistance and advice from the SRT) of booms, absorbants, vacuum pumps, etc., necessary to contain or neutralize the spilled substance or protect

property (water intakes, small craft harbours, bird sanctuaries, etc.) from the pollution. It would also include any measures necessary to stop more pollutant from spilling.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) The Proponent be a member of the National Emergency Equipment Locator System (NEELS), a computerized inventory bank of cleanup equipment available in Canada.
- ii) Trained personnel be available at key installations along the route to handle containment and cleanup equipment. Periodic "mock exercises" should be held to keep cleanup personnel up-to-date, and equipment in working order.
- iii) Containment and cleanup equipment be stockpiled at appropriate intervals along the pipeline right-of-way, and at high spill risk installations.
- iv) Every effort be made to contain any spill on land before it gets to any water body. Because of the steep terrain and proximity of freshwater systems or the sea in many areas, this could be difficult. Consideration should be given to fabricating and installing spill barriers in surface runoff ditches and depressions likely to catch oil or chemicals around some facilities.

- v) A spill be removed quickly from drainage ditches or a tank farm containment dyke area by using pumping systems with skimming heads, commercial or natural absorbants, physical removal of contaminated ground or burning under permit. If bunker oil is spilled, pumping or absorbing may be impractical because of its high viscosity. In this case, a continuous absorbant belt, conveyor system, special absorbant application or rake and shovel operation could be necessary.

In the event containment action fails on land and a stream or river channel operation is necessary:

- vi) Booms be deployed at critical points along the shore line, such as across the entrance to important waterfowl and fish resource areas and key water intakes, small boat wharfs, bird staging sites and fishery areas.
- vii) Booms be deployed in river channels at predetermined sites to contain the spill where the current is not too strong, or to deflect the oil into pre-designated collecting areas along the shoreline if the river flow velocity is high.
- viii) Booms be deployed anywhere in larger water bodies where oil can be trapped or corralled. Skimmers be used to collect oil diverted towards them with booms.

In the event containment action fails on land and in a river channel, a Beaufort Sea operation could be necessary:

- ix) Booms be deployed along the Mackenzie River in the Delta or in the Beaufort Sea to protect key wildlife, fisheries and harbour areas.
- x) Booms, skimmers and absorbants be deployed, weather permitting, in areas where floating oil can be contained or absorbed for pick up.
- xi) Special methods for cleaning up oil from ice infested waters and oil under ice which might result from experiments being carried out in the Beaufort Sea Program be incorporated into the Mackenzie Valley Pipeline Action Plan when they are developed.
- xii) Dispersing materials be used in Mackenzie Valley - Beaufort Sea pollution containment or cleanup operations, only within the restrictive guidelines published by Environment Canada for the controlled use of these materials.
- xiii) The Proponent formalize cooperative spill working arrangements with the other petroleum and industrial operators along the pipeline route. Equipment purchases by these organizations could then be further coordinated and cleanup staffs augmented for maximum efficiency.

c) Cleanup and Disposal:

This work involves the actions necessary to remove

the pollutant from the water and related on-shore areas using absorbants, skimmers and earthmoving machinery to physically pick up oiled beach materials. It should also include the collection of oiled birds and establishment of bird rehabilitation centres. Controlled disposal of pollutants and contaminated materials in approved locations where they will not re-contaminate the environment is an important activity in this phase. In an area having the fluctuating river and marine water level environments along the pipeline routes, this work must be done around the clock to prevent high water levels or heavy precipitation moving oil from polluted beaches and ditches to areas which were not previously contaminated. In winter, the oil should be picked up quickly to prevent migration under the snow and ice. If it gets under ice, efforts should be made to locate and recover oil before spring break-up.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) Drainage ditches and shoreline cleanup be done as quickly as possible with highest priority on areas environmentally sensitive. The Proponent is expected to have maps showing areas highly sensitive to spills in areas which could be affected by oil and chemical contamination.
- ii) For cobble and gravel beaches, natural materials or commercial absorbants be spread over the area to absorb the oil and then be recovered by hand raking.

- iii) Liquid oil-water mixtures, spent absorbants, contaminated driftwood and beach materials, be stored temporarily in 45-gallon drums or plastic lined pits, dug above the high water mark.
- iv) Permanent disposal methods be worked out using oil reclaiming facilities of the Proponent or at preselected government approved permanent land disposal sites.

d) Restoration:

This phase covers soil or shoreline material restoration, cleaning of private property such as piers and boats, and restoring to the satisfaction of the appropriate government agency as much as necessary of the living environment such as attempting oiled birds rehabilitation or restocking aquatic resources.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) Soil restoration be done with advice from recognized contaminated soil restoration experts, who could set up a program specific to the contamination problem at the site.
- ii) Cleaning of docks, boats and other private property be done on a high priority basis, or alternatively on-the-spot cash settlements be made to enable the affected parties to have their property cleaned by a private company.
- iii) Recreational beach restoration be done according to agreements reached with local territorial and municipal officials.

- iv) Bird and aquatic fauna rehabilitation be done according to agreements with Environment Canada Officials. The Canadian Wildlife Service could provide advice on bird rehabilitation operations.
- e) Payment of Damages, Cleanup Cost and Fines:

This phase generally takes place last, but the information and actions required in it must be recorded in detail from the start of the incident.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) In order that their work not be interrupted, operational personnel involved in the spill cleanup take part as little as possible in any legal investigations during the incident.
 - ii) All Proponent supervisory personnel involved in the incident keep thorough detailed notes of their activities and decisions during the incident.
 - iii) Proponent legal staff be assigned to work with government agencies, cleanup contractors and small claims from boat owners and fishermen during and after the incident.
 - iv) Small straight-forward claims from fishermen, private citizens and small businesses be settled quickly.
6. Overall Co-ordinating Instructions - This section should contain all the information required by

operational personnel, to really understand how an incident would be managed.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) Electronic portable communications among the operational personnel be of an excellent standard. Next to effective action planning, good communications for alerting personnel and for hour by hour co-ordination among cleanup forces is the most important operation parameter.
- ii) Spill cleanup progress briefings take place daily at the operations centre during the period action is required on an emergency basis. All cleanup staff supervisors, SRT members, advisors, etc., should be present.
- iii) Detailed minutes of these meetings be kept.
- iv) Agreed to courses of action for the SRT members and their work parties should be summarized in point form and circulated the following morning, in order that no misunderstanding develop.
- v) Senior management, press and government agency liaison personnel, should attend the daily briefings.
- vi) Press conferences be held once per day with the OSC and any necessary technical advisers in attendance. The public relations member of the SRT be available to the press at any time and arrange tours and telephone facilities for them.

7. Appendices - Non-operational sections of the Action Plan should contain information on word definitions, who has copies of the Plan, Plan up-dating procedures, communications, legal authorities, financial procedures and a list of Non-Proponent Plans for the pipeline route areas.

For a Mackenzie Valley Pipeline, it is recommended that:

- i) The Plan be distributed to all appropriate Proponent headquarters and field staff, and government agencies operationally concerned or having jurisdiction along the route.
- ii) The Plan be updated and operationally tested by field exercises at least once per year on a scheduled and documented basis. Plans of these exercises should be submitted to the relevant government agency for review one month in advance.
- iii) Portable radio and telephone communications be reviewed and use procedures outlined.
- iv) Legislation applicable to a spill incident along the route be summarized.
- v) The non-Proponent Action Plans along the route be listed.

F. THE ROLES OF GOVERNMENT AGENCIES:

D.I.N.A., through the Territorial Government, assumes operational leadership and management of spills on behalf of the Federal Government in the Northwest Territories for all land environmental emergencies occurring north of the 60th parallel. The Northwest Territories Government has formed an emergency control committee to carry out this coordination. Serving on this committee are the following federal government departments:

- Department of National Defence
- Ministry of Transport
- Department of Indian and Northern Affairs
- Department of the Environment
- Royal Canadian Mounted Police
- Department of Manpower
- Department of Public Works
- Canadian National Telecommunications
- Northern Canada Power Commission
- Northern Transportation Company Limited

In the Yukon, D.I.N.A. assumes operational leadership and management of spills on behalf of the Federal Government for all spills which occur as a result of land use operations under a Territorial Land Act permit, and operations that have a Water Use Licence or Water Use Authorization under the Northern Inland Waters Act. D.O.E. assumes operational leadership and management of spills resulting from operations not under such a licence or permit. An ad hoc committee carries out this coordination of spill response. Membership on this committee includes:

more important territorial and federal agencies which should fit into an operator's plan are as follows:

1. The Territorial Emergency Control Committee (TECC) Yellowknife, is a senior management body designed to assume the lead role on behalf of D.I.N.A. in organizing and implementing a response to a major war or peacetime emergency including oil and chemical spills in the Northwest Territories.
2. The Yukon Disaster Committee, Whitehorse is a senior management body designed to assume the lead role in organizing and implementing a response to a major war or peacetime emergency including oil and chemical spills in the Yukon Territory.
3. The On-Scene Co-ordinator (OSC) co-ordinates and directs government pollution control efforts at the scene of a pollution incident.
4. Pollution Prevention officers have been located at specific centres to action reports of spills into Arctic waters, on the mainland or islands of the Canadian Arctic which may enter Arctic waters.
5. The local offices of Environmental Protection Service, D.O.E. located at Yellowknife and Whitehorse are to provide technical advice and

guidance to federal and territorial bodies on emergency matters.

6. The Federal Inter-departmental Regional Environmental Emergency Team (REET) is established on a regional basis. The Pacific Team located at Vancouver and the Northwest Team located at Edmonton would serve as a Resource Element to the appropriate committee in case of a major incident.
7. The National Environmental Emergency Team (NEET) is an inter-departmental consultative mechanism at the federal headquarters level.

Any funds spent by the federal government for spill mitigation would be recovered from the polluter after an incident.

G. CONCLUSIONS:

1. Construction and operation of gas or oil pipeline through the Mackenzie Valley would considerably increase the risk of petrochemical spills in the area.
2. There are many aquatic and wildlife resources in the Beaufort Sea and Mackenzie Valley which could be seriously harmed by spills of oil or chemicals.
3. The impact of spills in the area could reduce the value of these living resources for subsistence and recreational uses.
4. Effective spill contingency planning would minimize the incidence of spills and reduce the magnitude of their impact on the living environment.
5. A highly co-operative effort on the part of industry and government is recommended as the best means of achieving effective spill mitigation measures for a pipeline project.

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BIOGRAPHY

NAME: R. K. Pettigrew

EDUCATION: 1935 - 1939 - University of Saskatchewan
B. A. Major in Geology

EXPERIENCE: 1945 - 1970 - Twenty-five years experience in the oil industry, primarily with Shell Oil Company, as a Production and Exploitation Engineer involved with drilling and development activities of oil and gas fields. Areas involved were Trinidad, B.W.I., Venezuela, parts of U.S.A. and Canada.

1971 - Australia and North Africa: Geological and Petroleum Engineering Consulting.

1972 - One year in Ottawa with Environment Canada in
to present Policy Planning and Research Directorate.

- 3 years in Edmonton with Environmental Protection Service of Environment Canada, involved with the development of an Environmental Emergency Branch. Prime objectives have been to develop an integrated response mechanism to spill emergencies, reporting procedures, contingency planning and Research and Development aspects.

